

To: Christoph Goss[christoph.goss@deereault.com]; Sorenson - DNR, Allen[allen.sorenson@state.co.us]
Cc: Way, Steven[way.steven@epa.gov]; Matt Francis[m.francis@erllc.com]
From: Don Deere
Sent: Fri 8/21/2015 3:59:22 PM
Subject: RE: Gold King Volumes

Christoph, I would agree that a major blowout is unlikely this fall and winter because we are on the falling limb of the hydrograph and we have relieved pressures with the event and current drainage. HOWEVER the risk of a blowout event next spring and early summer rises considerably with recharging of the workings with snowmelt. It is possible and even likely that additional collapses in the workings were induced by the rapid drainage that occurred. A good analogy for example is that sinkholes occur in the limestone caves in Florida when the water table is drawn down during drought or by pumping of wells. The roof is no longer supported by water pressure. Another analogy is dewatering of hydroelectric pressure tunnels for inspection often induces collapses and is why ROV inspection of a full tunnel is now used much more widely. Thus if new collapses occurred in the workings after or during the rapid draining event they will be tested this spring due to snowmelt recharging the workings.

The conclusion is move forward full speed with the adit rehabilitation and inspection. A surge control partial bulkhead could be added to the work. I am imagining a concrete structure with slots for dropping in steel stoplogs.

I will be available for a call today. Don

Don W. Deere, P.E.

Chairman

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From: Christoph Goss
Sent: Friday, August 21, 2015 8:05 AM
To: Sorenson - DNR, Allen; Don Deere
Cc: Way, Steven; Matt Francis; Christoph Goss
Subject: RE: Gold King Volumes

Importance: High

All

Here are some preliminary thoughts on Gold King water volumes for consideration. Note that the numbers are all rounded. These thoughts and numbers are just a basis for discussion and not hard conclusions.

- Level 7 (portal) was designed as the haulage and drainage level. It will likely be the first to intercept groundwater coming up and much of the water percolating down would drain into it.
- Based on the assumptions below, the total volume of levels 7 is 3.6 million gallons
- An estimated 3 million gallons was released on August 5
- Given the 200' head difference between level 6 and level 7, most of the initial release likely came from Level 7 and the connected stopes and raises
- Typical flow rates from the Gold King since then have been around 550 gpm vs the 200 gpm typical flows before the incident
- One can assume that, based on the water buildup, somewhat more than 200gpm was the typical recharge rate into the mine, say 250gpm. Hence the source of the additional 300 gpm is likely the draining from upper levels
- 300 gpm for 15 days = 6,480,000 gallons
- Based on the assumptions below, the total volume of the levels above 7 is 11 million gallons. This means that 60% of the capacity of the upper workings could have been drained.
- While roof falls and local blockages are likely in the mine, much of the volume of the workings is likely still open and connected
- Non-engineered plugs/blockages, roof falls are unlikely to hold back a high water head (10s of feet, not hundreds)
- Flow rates have been slowly dropping, suggesting a steady draining of the upper levels
- Based on these considerations, minor "burps" of sludge are possible, but a major blowout is unlikely.

Critical question: Is any information known about the volume of the stopes in Gold King? The volumes calculated are limited to 8x8 drifts. For some volume of stopes the conclusions above are still valid.

Christoph

From: Christoph Goss
Sent: Thursday, August 20, 2015 5:05 PM
To: 'Sorenson - DNR, Allen'; Don Deere
Cc: 'Way, Steven'; Matt Francis; 'christoph.goss@deereault.com'
Subject: Gold King Volumes

All

Here is a quick summary of volumes and elevations at Gold King based on the information provided by DRMS. I think that this table will serve as a good basis for discussion tomorrow. Please comment on my assumption of typical 8x8 dimensions of the workings and check the portal elevation.

How much is known about the water source in the Gold King (precipitation trickling through upper levels vs groundwater rising from below)? How wet were the upper levels during mining?

Christoph

From: Sorenson - DNR, Allen [<mailto:allen.sorenson@state.co.us>]
Sent: Thursday, August 20, 2015 3:08 PM
To: Christoph Goss

Subject: Fwd: Gold King Length along Levels

----- Forwarded message -----

From: **Brown - DNR, Kirstin** <kirstin.brown@state.co.us>

Date: Tue, Aug 18, 2015 at 10:35 PM

Subject: Gold King Length along Levels

To: Allen Sorenson - DNR <allen.sorenson@state.co.us>, Bruce Stover - DNR
<Bruce.Stover@state.co.us>

Here are the lengths.

I gave a copy of everything I had to EPA on a hard drive.

I need to get a copy to you all too.

I will buy a thumb drive and get it to you. Problem is, I need a 1 terrabyte thumb drive because there is so much.

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Kirstin Brown

Colorado Division of Reclamation, Mining and Safety

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Durango, CO 81301

(970) 903-7889

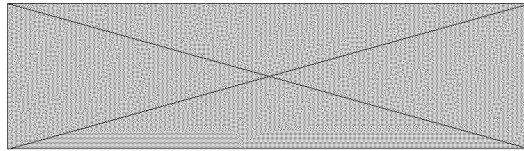
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